KSC ENGINEERING

Integrated Design & Analysis System (IDAS)

David P. Armstrong

EA-C

June 27, 2007

Agenda

- **IDAS Overview**
- **Projects Using Relex Applications**
- **Potential Relex Applications at KSC**
- **Present Status and Future of IDAS**

10 – 15 Minutes

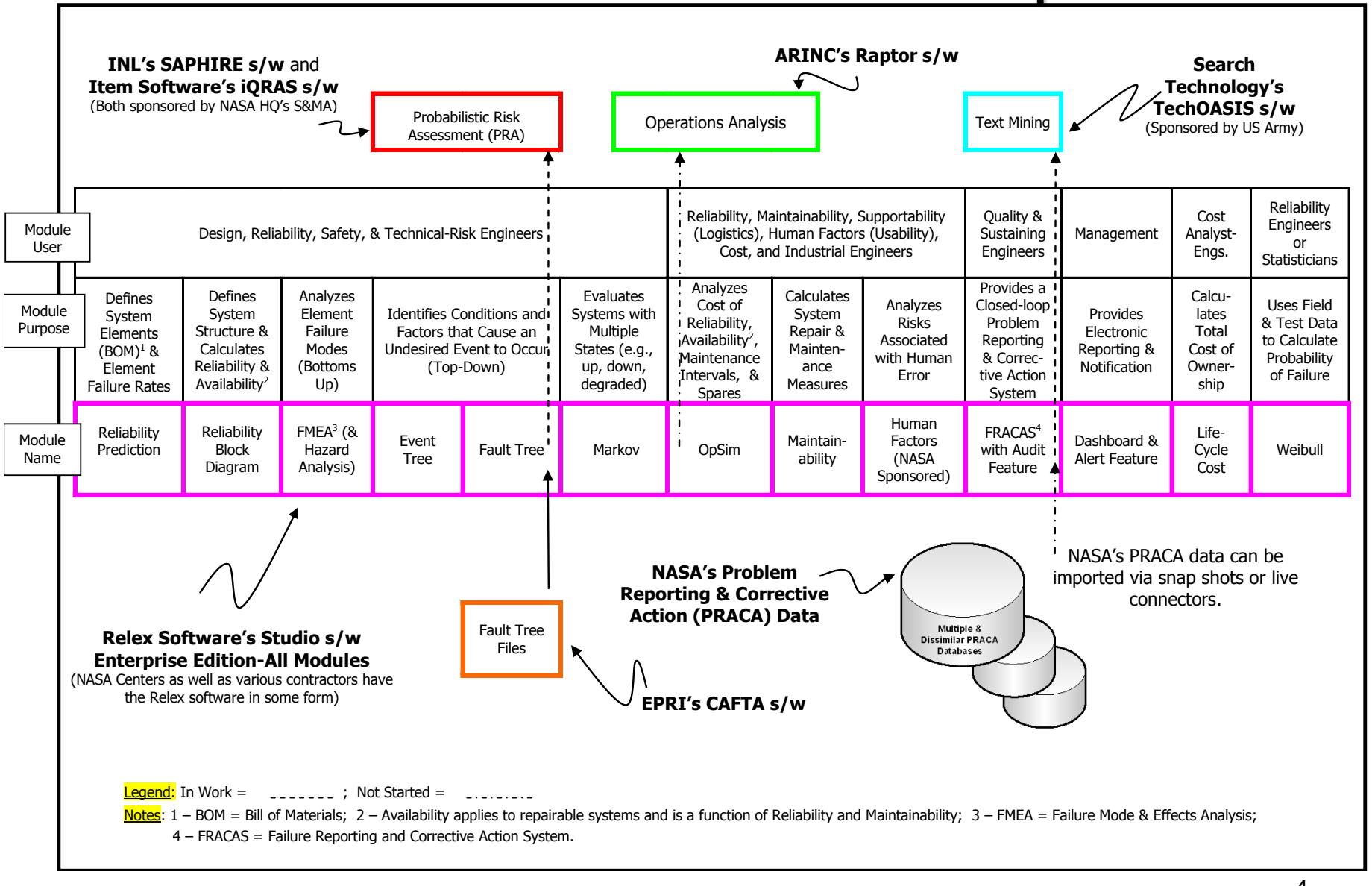
- **Live Demo**

15 – 20 Minutes

What is Integrated Design & Assurance System (IDAS)?

- **IDAS is:**
  - A system of integrated, documented, and supported analysis tools (with an optional reporting system) that allow design and assurance engineers to work in a collaborative manner over the life cycle of a system.
- **IDAS as a system**
  - Uses “best in practice” software tools.
  - Allows KSC engineers to work together any time without face-to-face meetings, e-mail, or paper.
  - Reduces the learning demand since the skills learned in one module are transferable to another module.
  - Provides tools and techniques that could improve an existing system or **support work on a new project**.
- **IDAS as a collection of tools**
  - Relex software provides a means to analyze and assess a system’s technical risk.
  - The Relex modules address the qualitative and quantitative dimensions of risk, including ***Likelihood*** and ***Consequence***
  - The Relex tools can be used by engineers specializing in design, safety, reliability, risk, maintainability, logistics, human factors, cost, quality, and corrective action (sustaining)

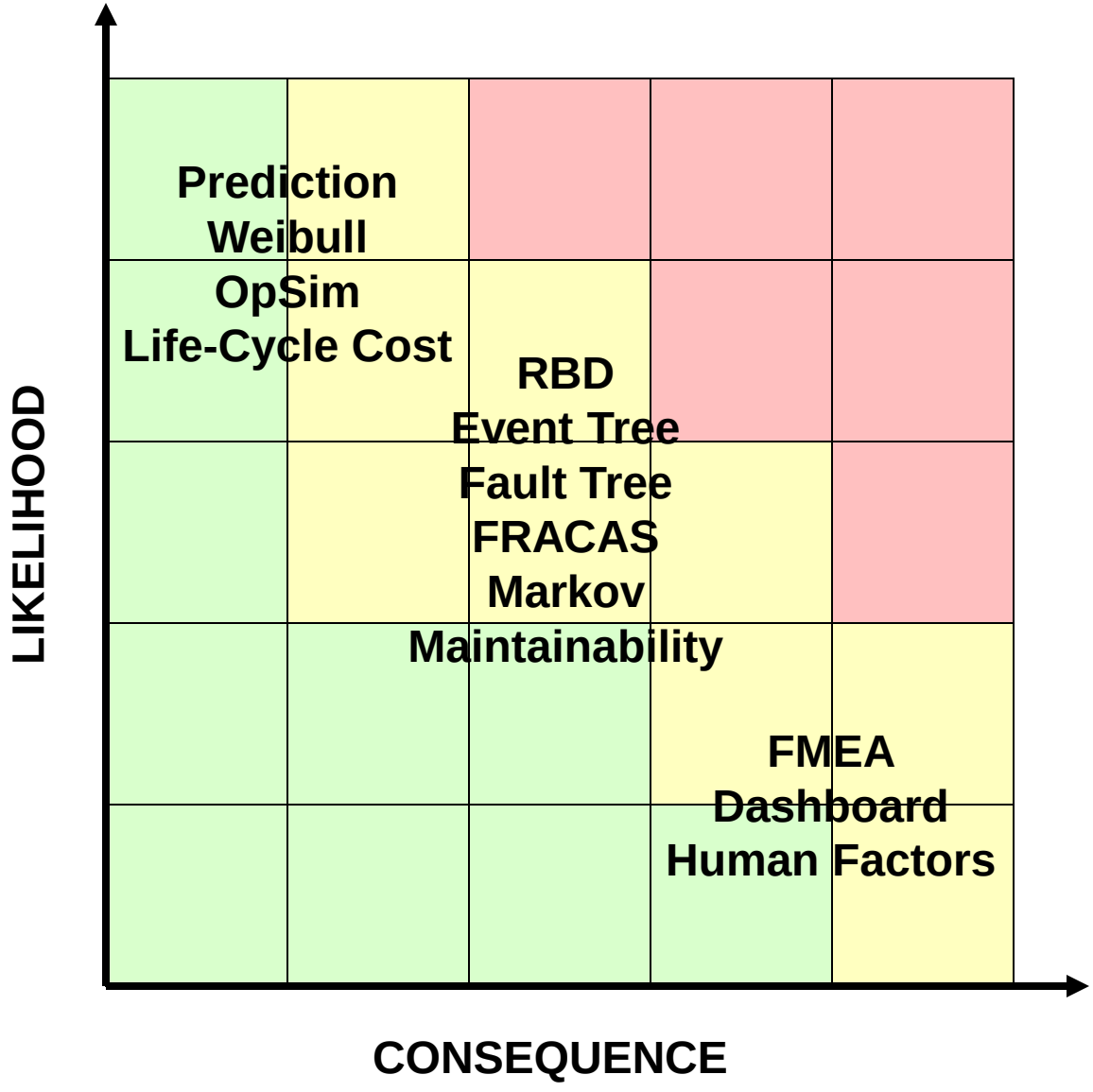
IDAS Elements and Relationships

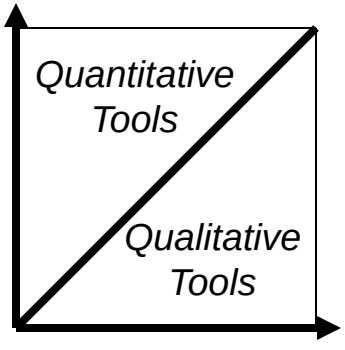


Legend: In Work = _____ ; Not Started = ...

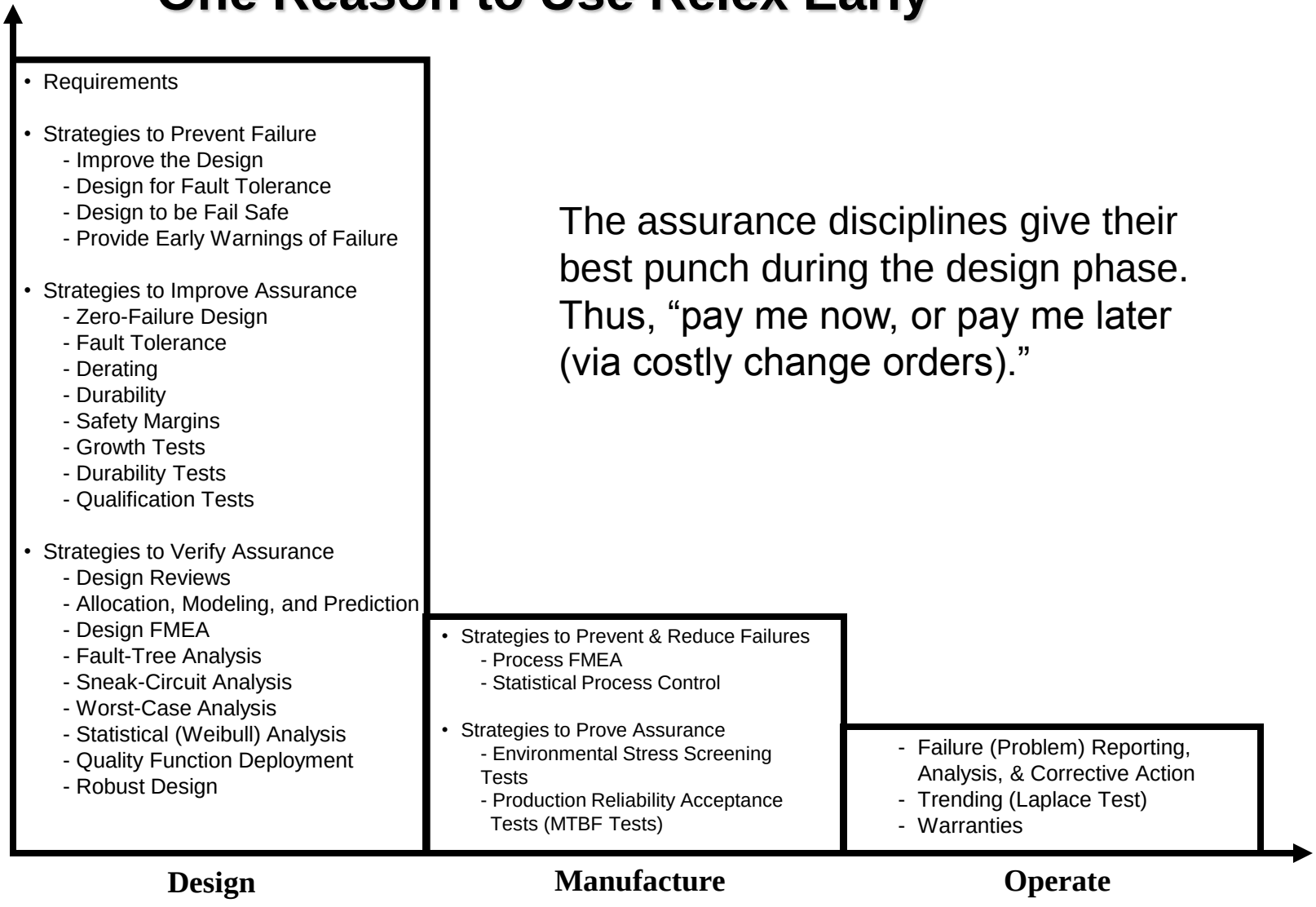
Notes: 1 – BOM = Bill of Materials; 2 – Availability applies to repairable systems and is a function of Reliability and Maintainability; 3 – FMEA = Failure Mode & Effects Analysis; 4 – FRACAS = Failure Reporting and Corrective Action System.

In the Area of Risk, Relex Tools Focus on Likelihood, Consequence, or Both





One Reason to Use Relex Early



The assurance disciplines give their best punch during the design phase. Thus, “pay me now, or pay me later (via costly change orders).”

Examples of RELEX used at NASA

Project	Relex Module	Company
Columbia, Entry Analysis	Fault Tree	MFSC & JSC
ISS Crew Health System (CHeCS)	RBD, Weibull	KSC & JSC
Mishap Investigation Boards (Numerous)	Fault Tree	KSC
NSI Cold Firing Analysis	RBD	JPL/NESC/GSFC
Agency Common PRACA Taxonomy (new)	FRACAS	NESC & KSC
KSC Hypergol Oxidizer Storage Facility at Fuel Storage Area #1	Fault Tree	SGS
Integrated Network Control System (INCS) and Safing; Pads & LCC	Fault Tree	USA
30-Ton Bridge Cranes; OPF's 1 & 2	Fault Tree	USA
LO2/GO2 Fuel Cell Servicing System; Pads & MLPs	Fault Tree	USA
60 Hz Low Voltage Power Distribution; Pad A	Fault Tree	USA
KCCS Field Interface Controllers (FIC); Pad A	Fault Tree	USA
Crawler Tread Belt Shoe Failure	Fault Tree	USA
CAPPS/AGV Platform SAA	All Modules	Boeing
Cx Launch Equipment Test Facility (LETF)	Fault Tree, FMEA	ASRC
ATDC Automated Umbilical System; Complex 20 Test Facility	Fault Tree, FMEA	ASRC
KSC Electrical Power System Hazard Analysis	Fault Tree	ASRC
Hypergolic Propellant Loading Hazard Analysis; LC 39B	Fault Tree	ASRC
Environmental Control System (ECS) Hazardous Analysis; LC39B	Fault Tree	ASRC

Relex Can Help Here

- **NE lists 10 Major and 73 Minor Subsystems in work, including:**
  - Sound Suppression
  - Environmental Control System (ECS)
    - First Stage SRB and CLV US Aft Skirt……
  - Gaseous Helium (GHe), Nitrogen (GN2), and Oxygen (GO2)
    - Tank Pre-pressurization, Purge, Firex……
  - Hydraulics
  - Hypergolic Servicing
  - Handling and Access
    - Crew Access, SRB Engine Service Platforms, HPU Servicing……
  - Launch Accessories
  - Umbilicals

Status of KSC's IDAS

- **IDAS Software (Tools)**
  - Relex Software is now available, owned by KSC, and installed on a secure KSC server
  - TechOASIS software (text mining) has been received. Next step is to make the import filters.
  - IDAS server backed up on a daily basis
  - Upon request, new user can be online with Relex in less than one hour
- **IDAS Team: Four Individuals offering Full Support**
  - Two NASA and Two SAIC with training and experience in engineering, assurance, and IT
  - Services range from account administration to complete system development
  - Relex Technical Support available to all KSC users (phone, email, webinar)
- **120 Registered Relex users today at KSC (and growing)**
  - NASA, SAIC, USA, ASRC, Boeing, SGS and SRS
  - Early June, 22 users completed a 3-Day on-site Training Course

Status of KSC's IDAS (continued)

- **Currently:**
  - Funding for the Relex maintenance plan ends December 2008
  - Funding for SAIC's two full-time Application Engineers ends December 2007 (contract end date is March 2008)
- **Future:**
  - For IDAS to continue, it needs a funding mechanism.

Live Demo

* for a full demo in HQ Room 3358, contact the IDAS team at any time.

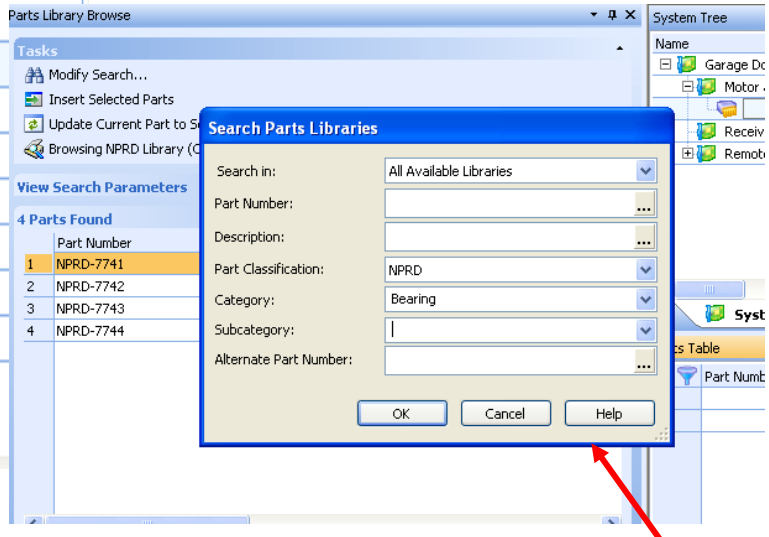
Tim Adams IDAS Project Manager and Designer	NASA	867-2267
Dave Armstrong IDAS Deputy Project Manager	NASA	861-3976
Tony Burris Application Engineer	SAIC	867-7336
Wayne Fowler Application Engineer	SAIC	867-7334

Backup Materials

Relex Reliability Prediction Module

System Tree

Name	Failure Rate, Predicted	Failure Rate Type	MTBF Specified	MTTR Type	Reference Designator
Garage Door Opener	21.904982	Calculated	#	Calculated	S1
Wall Switch	0.011589	Calculated	#	Calculated	P1
Motor and Drive	8.850000	Specified, Failure Rate	#	Calculated	A1
Receiver Circuit	6.150000	Specified, Failure Rate	#	Calculated	A2
Entry Keypad	1.750000	Specified, Failure Rate	#	Calculated	A3
Remote Control	0.697004	Calculated	#	Calculated	A4
Contact Safety Reverse	1.950000	Specified, Failure Rate	#	Calculated	A5
Non-Contact Safety Reverse	2.500000	Specified, Failure Rate	#	Calculated	A6



System Tree

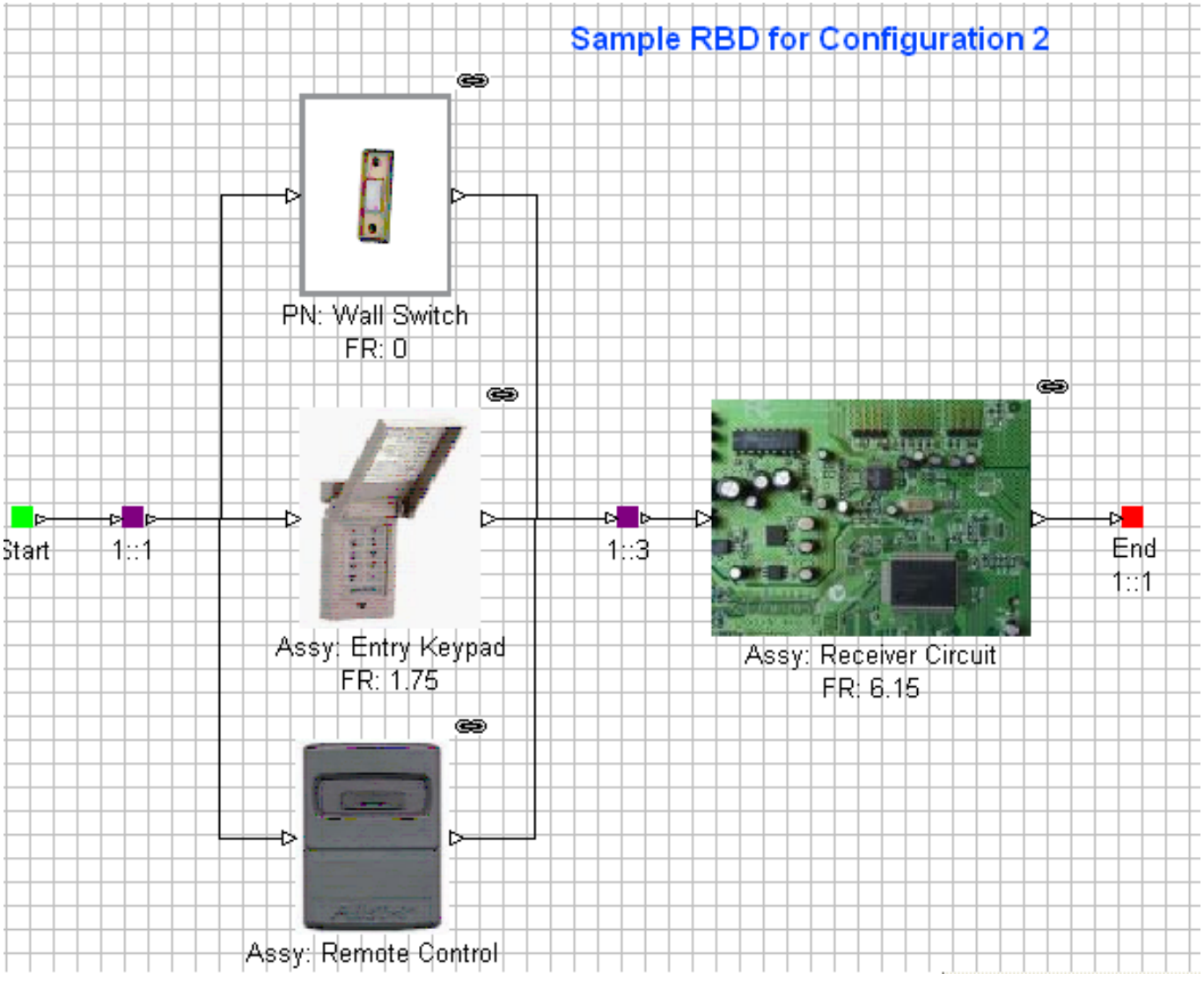
Parts Library Search

Calculation Data

Name:	Garage Door Opener	MTTR Type:	Calculated
Calculation Model:	217Plus	MTTR Specified:	#
Temperature:	35.00	Cost Type:	Calculated
Temperature Delta:	#	Cost, Specified:	$0.00
Temperature, Dormant:	17.0	Failure Rate Type:	Calculated
Environment, PRISM / 217Plus:	G - Ground	Failure Rate, Specified:	#.#
Process Grade File:	< Select File ... >	MTBF Specified:	#

Part Calculation Data

Relex Reliability Block Diagram (RBD) Module

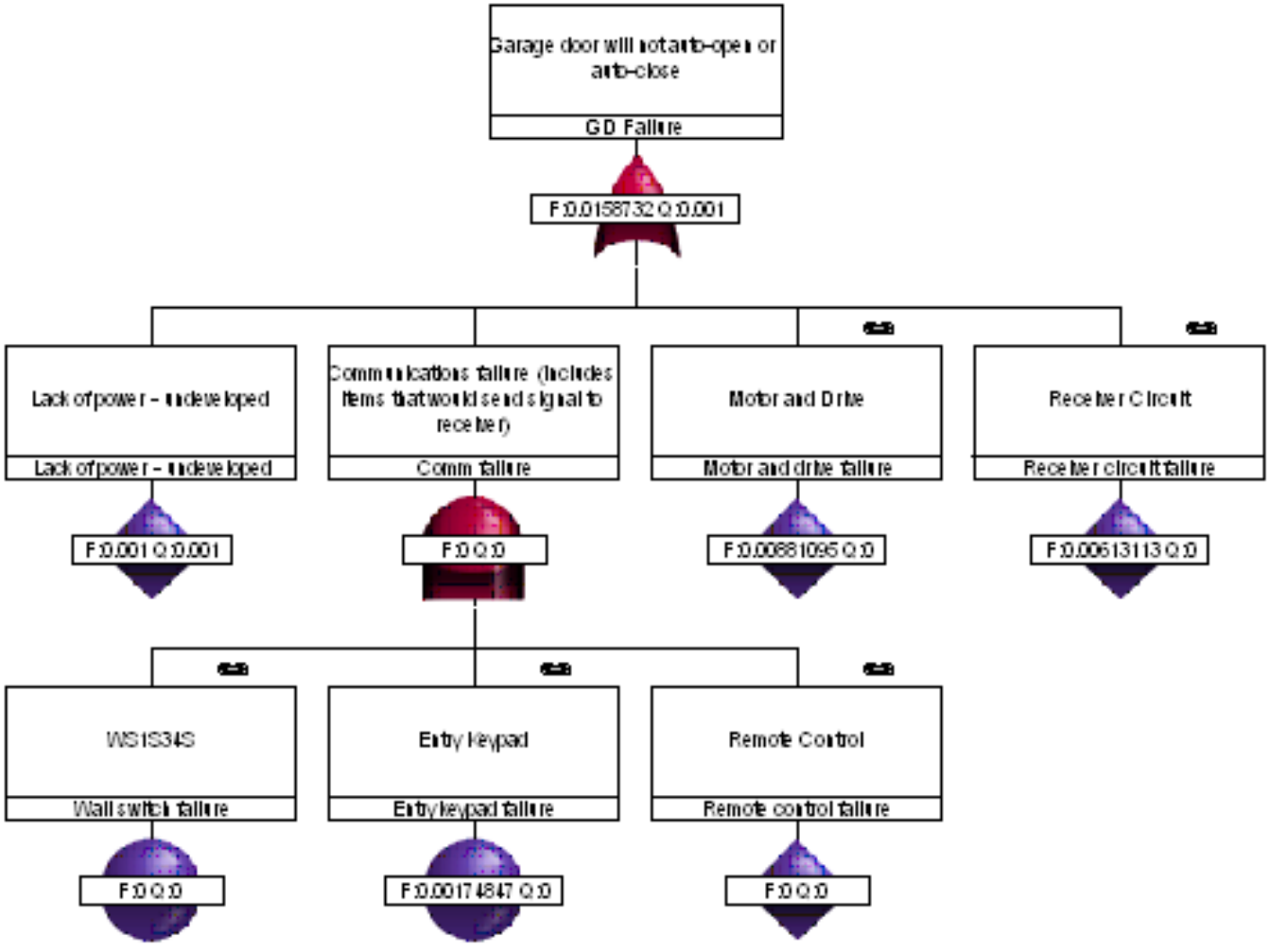


Relex FMEA Module

FMEA Worksheet

	Item Identifier	Item Name	Item Description	Mode Identifier	Failure Mode	Local Effect	Next Effect
1	Item53	GD01	Garage Door Opener	Mode383	Wall switch fails	Garage door cannot be auto-opened upon command	Garage door cannot auto-opened or auto-closed with wal switch
2				Mode385	Motor and Drive Failure	Garage door cannot be auto-opened or auto-closed	Garage door cannot auto-opened or auto-closed
3				Mode387	Receiver failure	Garage door cannot be auto-opened or auto-closed	Garage door cannot auto-opened or auto-closed
4				Mode389	Entry keypad failure	Garage door cannot be auto-opened or auto-closed with entry keypad	Garage door cannot auto-opened or auto-closed with ent keypad
5				Mode390	Remote control fails to open/close correct door	Garage door cannot be auto-opened or auto-closed with remote control	Garage door cannot auto-opened or auto-closed with remote control

Relex Fault Tree Module



Relex Weibull Module